

REMARKS

I. Status of the Claims

Claims 1, 3, 4, 8, 18, 26, 27, 29, 35, 73, 75, 78, 79, 81-83, and 87-89 are now pending in this application. Claims 2, 5-7, 9-17, 19-25, 28, 30-34, 36-72, 74, 76, 77, 80, 84-86, and 90-121 were cancelled previously, without prejudice or disclaimer. Claim 1 is amended herein to harmonize its punctuation and to incorporate the elements of claim 79 and the limitations that the intermediate block is a random copolymer block and that (in the context of the intermediate block) the at least one constituent monomer of the at least one first block differs from the at least one constituent monomer of the at least one second block. Claim 79 is thus cancelled without prejudice or disclaimer. Without prejudice or disclaimer, claim 81 is amended herein to correct its dependency. Exemplary support for these amendments can be found in the claims and specification as originally filed, for example, original claim 79, and paragraphs [006]-[008], [051]-[053], and [0200] of the specification as-filed. Accordingly, the specification provides written description support for these amendments, and no new matter has been added.

II. Rejections Under 35 U.S.C. § 103(a)

The Examiner maintains all of the rejections previously presented for the reasons of record. Specifically, the Examiner maintains the rejection of claims 1, 3-4, 8, 18, 26, 27, 29, 35, 73, 75, 78, 79, 81-83, and 87-89 under 35 U.S.C. § 103(a) as allegedly unpatentable over U.S. Patent No. 6,410,005 to Galleguillos et al. ("Galleguillos"), U.S. Patent No. 6,663,855 to Frechet et al. ("Frechet A"), U.S. Patent No. 6,685,925 to

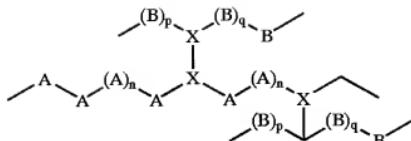
Frechet et al. ("Frechet B"), U.S. Patent No. 6,197,883 to Schimmel et al., or U.S. Patent No. 6,153,206 to Anton et al. ("Anton"), in view of U.S. Patent No. 5,994,446 to Graulus et al. ("Graulus"), U.S. Patent No. 6,518,364 to Charmot et al. ("Charmot"), or U.S. Patent No. 6,410,666 to Grubbs et al. ("Grubbs"). See Oct. 21, 2008, Office Action at 2-12.

Applicants respectfully traverse for the reasons of record and the additional reasons presented below.

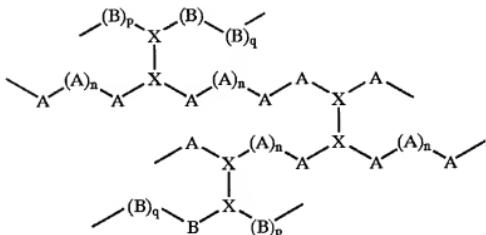
Galleguillos

The claimed invention, as-amended, would not have been obvious in view of Galleguillos because it fails to teach or suggest each and every limitation. Specifically, the alleged intermediate block of Galleguillos pointed out by the Examiner is not random, as is required by Applicants' claims as amended. Instead, the alleged intermediate blocks are ordered in that they comprise X monomers which are linked to A monomers on one side and B monomers on the other. See Galleguillos at col. 4, Structures 1 and 2.

Structure 1



Structure 2



Moreover, the use of X monomers, or chain extenders, as linkers between two blocks is a key feature of Galleguillos. Allyl methacrylate ("All MA") was used as a chain extender in Examples 1-3 and 5 of Galleguillos. Example 4 of Galleguillos was prepared similarly to Example 5 except that it lacked All MA. Example 6 contained ethylene glycol dimethacrylate and not All MA. See *id.* at cols. 22-23, Tables 2 and 3. Galleguillos states that "[t]he hydrophobic block of Polymer 4, after neutralizing with base at high pH, did not dissolve in water. The polymer formed a milky, phase-separated suspension. Conversely, the polymer of Example 5, which includes All MA, formed a water clear solution after neutralization with base at pH=7.16." *Id.* at col. 23, II. 5-10. Galleguillos further notes the following: "Resin of Example 6 was prepared using ethylene glycol dimethacrylate, EGDMA, a difunctional chain extender whose reactive groups have comparable reactivity. The resulting polymer was heavily cross-linked and

formed a solid gelled mass during polymerization. The polymer was impossible to isolate and test. In contrast the polymer of example 5, prepared with allyl methacrylate, formed an easy-to-handle viscous liquid, during polymerization." *Id.* at col. 23, ll. 34-41. Thus, Galleguillos teaches synthesis of block polymers using All MA; indeed, other than polymers 4 and 6, all of the remaining 10 polymers whose synthesis is described (polymers 1-3, 5, and 7-12; *see id.* at Tables 2-6) contain All MA and two other monomers. As discussed above, use of a chain extender or X monomer to link blocks to produce alleged intermediate blocks does not produce random intermediate blocks, and Galleguillos would have taught away from polymer synthesis without allyl methacrylate.

Additionally, Galleguillos is silent regarding polydispersity, and, therefore, provides no teaching or suggestion to meet that limitation of Applicants' claims as amended. Contrary to the Examiner's position, the secondary references, Graulus, Grubbs, or Charmot, do not remedy the deficiencies of Galleguillos. As discussed *infra* in the section discussing Frechet A and B, none of the secondary references would have guided one skilled in the art to modify Galleguillos in such a way as to result in the claimed polydispersity. In fact, as discussed *infra*, all of the secondary references would have taught away from the claimed polydispersity.

Therefore, Applicants respectfully submit that the instant claims as amended would not have been obvious over Galleguillos in view of Graulus, Grubbs, or Charmot. Applicants also observe that the Examiner appears to imply that the presence of compositional and architectural limitations may overcome Galleguillos (see October 21,

2009, Office Action at 4) and courteously solicit the Examiner's consideration of the amended claims in this regard.

Frechet A and Frechet B

The claimed invention, as-amended, would not have been obvious in view of Frechet A and B because it fails to teach or suggest each and every limitation. Applicants' claims as amended require that the polymer have a polydispersity index (PDI) of greater than or equal to 2.5. The Frechet references are silent with respect to this characteristic. However, the Examiner alleges that it would have been "obvious and fully within the purview of one having ordinary skill in the art to control the optimum molecular weight, polydispersity, . . . by varying experimental parameters . . . as shown in ancillary references, US 5,994,446, US 6,518,364 and US 6,410,666 . . ." Oct. 21, 2009, Office Action at 11.

Applicants previously pointed out that these references do not recognize polydispersity index as a result-effective parameter, and, therefore, one skilled in the art would not have been motivated to modify the various synthetic parameters in order to arrive at the claimed polydispersity index. Moreover, none of the references cited by the Examiner suggest that a PDI higher than a threshold value may be advantageous. Frechet is completely silent regarding this quantity, and the ancillary references cited by the Examiner contain guidance that would have lead the skilled artisan away from the claimed invention. For example, Grubbs notes the following:

While the PDIs of all of the isolated polymers were less than or about 2.0, higher monomer to CTA ratios resulted in more polydisperse samples. This is most likely due to an increased viscosity of the reaction mixture, which is expected to slow or prevent monomer from reacting with

growing polymer chains. It may be possible to employ a co-solvent to help alleviate this **problem**.

See Grubbs at col. 17, lines 48-55 (emphasis added). Thus, Grubbs considers a PDI greater than 2.0 to be a problem. Moreover, Graulus and Charmot also would have taught away from a PDI greater than or equal to 2.5. According to Charmot,

Several reports have shown that dithioesters in RAFT emulsion polymerization produce substantial retardation, latex that contains high level of grit, and polymer with **poor control (e.g., polydispersity of 1.8 and higher)** (see, for example, *Journal of Polymer Science: Part A : Polymer Chemistry*, Vol. 38, 3864-3874, 2000). Mini-emulsions have been used to **alleviate these difficulties** to some extent, but again this very much limits its industrial application.

See Charmot at col. 2, lines 5-13 (emphasis added). Thus, Charmot teaches that PDIs of 1.8 and higher represent poor control and are considered difficulties to be alleviated. According to Graulus,

Similarly to tBMA, polymerization of IBMA is not "living" in an apolar solvent at room temperature and a broad molecular weight distribution is observed, 2.25 in toluene and 5.05 in cyclohexane, as shown in Table 1. This situation is however **significantly improved** by addition of 10% THF, since the **molecular weight distribution dramatically decreases** down to 1.25 in the 9/(v/v) toluene/THF mixture and to 1.20 in the cyclohexane/THF mixture of the same composition.

See Graulus at col. 14, lines 18-26 (emphasis added). The molecular weight distribution values referred to are in the column of Table 1 labeled Mw/Mn, which is the definition of PDI. Thus, Graulus teaches that a PDI of 1.25 represents a dramatic decrease and significant improvement relative to PDIs of 2.25 and 5.05.

In view of these teachings by the secondary references, if one of ordinary skill in the art were to set about optimizing polymer structure, which Applicants do not concede that one of skill in the art would have been motivated to do in view of Frechet A and B

since PDI is not recognized as a result-effect parameter, the Examiner has provided no credible basis for why this person would have modified the PDI to be within Applicants' claims when the ancillary references cited by the Examiner teach that PDIs greater than a threshold value such as 2.0 are problematic.

Schimmel

The Examiner alleges that in Example A of Schimmel, HPMA (hydroxypropyl methacrylate) "falls within the scope of the instant intermediate block constituent." Oct. 21, 2009, Office Action at 9. Applicants' claims as amended require that the intermediate block comprise at least one constituent monomer of the at least one first block and at least one constituent monomer of the at least one second block; wherein the at least one constituent monomer of the at least one first block differs from the at least one constituent monomer of the at least one second block. The claimed invention, as-amended, would not have been obvious in view of Schimmel because it fails to teach or suggest this limitation.

Example A of Schimmel does not read on Applicants' claim as amended because the at least one constituent monomer of the at least one first block does not differ from the at least one constituent monomer of the at least one second block. Rather, both monomers can only be HPMA in Example A of Schimmel. Nor is this limitation met by the hypothetical statements of the Examiner at pages 8-9 of the Office Action, in which the Examiner alleges that "the hydroxyl functional monomer randomly occupy the first and second block, as well as in the middle of the block." Again, in this scenario, the at least one constituent monomer of the at least one first block does not differ from the at

least one constituent monomer of the at least one second block. Instead, the monomer from the first block is the same as the monomer from the second block.

Moreover, Schimmel generally discloses polymers having PDI values less than 2.5. See Schimmel at col. 8, line 65 – col. 9, line 3. Thus, Schimmel fails to teach or suggest the limitations of Applicants' claims as amended. The secondary references, Graulus, Grubbs, or Charmot, do not remedy this deficiency because they teach away from modifying the polymers of Schimmel to bring them within the scope of Applicants' claims, as discussed in detail above. Therefore, Applicants respectfully submit that the instant claims as amended would not have been obvious over Schimmel in view of Graulus, Grubbs, or Charmot.

Anton

The claimed invention, as-amended, would not have been obvious in view of Anton because it fails to teach or suggest this limitation. Specifically, Anton fails to teach or suggest an intermediate block that is a random copolymer block wherein the at least one first block is present in an amount ranging from 50% to 90% by weight and the at least one second block is present in an amount ranging from 5% to 45% by weight.

However, the Examiner alleges that the structural limitations regarding the first, second, and intermediate blocks are met by the representative architectures of Anton in the table at column 4, lines 28-60. See Oct. 21, 2009, Office Action at 10. Applicants respectfully disagree. This table contains seven representative architectures. The first (i.e., block copolymer) third (i.e., block terpolymer), and sixth (i.e., graft terpolymer) representatives do not contain a random intermediate copolymer block. The second (i.e., random copolymer), fourth (i.e., random terpolymer), and seventh (i.e., random

polymer) representatives are random throughout and do not meet the limitations of Applicants' claims as amended, including at least that they comprise a first block that is present in an amount ranging from 50% to 90% by weight relative to the total weight of the block polymer. Polymers that are random throughout would not somehow contain a first block, second block, and intermediate block such that each satisfies the various limitations required of it by Applicants' claims. The fifth representative (i.e., graft copolymer) also fails at least to comprise a first block that is present in an amount ranging from 50% to 90% by weight relative to the total weight of the block polymer.

These representatives are described as "in accordance with the invention" of Anton (see Anton, col. 4, lines 28-29) and neither Anton nor the secondary references, Graulus, Grubbs, or Charmot, teach one of skill in the art to modify them to bring them within the scope of Applicants' claims as amended. Therefore, Applicants respectfully submit that the instant claims as amended would not have been obvious over Anton in view of Graulus, Grubbs, or Charmot.

Additionally, Anton is silent regarding polydispersity, and, therefore, provides no teaching or suggestion to meet that limitation of Applicants' claims as amended. As discussed above, the secondary references, Graulus, Grubbs, and Charmot, do not remedy the deficiencies of Anton, because all of the secondary references would have taught away from the claimed PDI.

To summarize, unlike *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1730, 82 U.S.P.Q.2d 1385, 1388 (2007), which involved a mechanical invention, the present invention is directed to the chemical arts, which is much more complex and

unpredictable, and, as discussed above, the prior art cited by the Office does not provide a finite number of predictable solutions that would have guided one skilled in the art to the claimed invention. See M.P.E.P. § 2143 (stating that "choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success" is a rationale to demonstrate obviousness); *see also KSR*, 127 S. Ct. at 1742, 82 U.S.P.Q.2d at 1397 ("When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp."). For example, PDI is one aspect of block polymers among many (for example, number of blocks, absolute block size, relative block sizes, architecture of block connections, choice, number and arrangement of monomers¹ within and across blocks, solubility, viscosity, elasticity, and Tg) and, in general, these aspects individually present many more than two options, leading to a large combinatorial set of individual possibilities. Modifying the primary references cited by the Office in such a way as to result in the claimed invention would certainly not have required a decision to choose from a finite number of predictable solutions, as contemplated by *KSR* and the M.P.E.P., especially in view of the secondary references, which actually would have taught away from the claimed PDI.

Moreover, as discussed above, the Office has not provided any logical reason why one of skill in the art would have been motivated to modify the nearly infinite

¹ Further to the choice of monomers, Applicants point out that Charmot explicitly lists in excess of 100 possible monomers as well as isomers of many of them. See Charmot, col. 15, line 42 - col. 16, line 31.

number of unpredictable solutions set forth in the references in such a way to result in the claimed invention. Indeed, after the *KSR* decision, the Federal Circuit recently held that the Office must "identify[] 'a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in a way the claimed new invention does' in an obviousness determination." *Takeda Chem. Indus., Ltd. v. AlphaPharm Pty., Ltd.*, 83 U.S.P.Q.2d 1169, 1174 (Fed. Cir. 2007). In the present case, the Office has not provided any reason that would satisfy this requirement and make a case of *prima facie* obviousness.

Because the cited references fail to teach or suggest each and every limitation of the claimed invention and there would have been no reason to modify the nearly infinite number of unpredictable solutions in the references in such a way as to result in the claimed invention, Applications respectfully submit that the rejections should be withdrawn.

Conclusion

In view of the foregoing amendments and remarks, Applicants submit that this claimed invention, as amended, is neither anticipated nor rendered obvious in view of the prior art references cited against this application. Applicants, therefore, request the Examiner's reconsideration of the application and the timely allowance of the pending claims.

If the Examiner believes a telephone conference could be useful in resolving any of the outstanding issues, she is respectfully urged to contact Applicants' undersigned counsel at 202-408-4342.

If there is any fee due in connection with the filing of this Statement, please charge the fee to our Deposit Account No. 06-0916.

Respectfully submitted,

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Dated: March 23, 2009

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